An alternate venous route for ventriculoatrial shunts

Technical note

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For the past 20 years, the ventriculoatrial shunt has been the procedure of choice to control hydrocephalus. For obvious reasons, the right internal jugular vein has been selected as the preferred route to reach the right atrium. However, there are some instances when the jugular vein is not available because it has become thrombosed. When this occurs it is necessary to use other routes to reach the right auricle and these include the transthoracic.

Although the subclavian vein has been mentioned as a means for placing a venous catheter in the right atrium, there is no report dealing with the precise landmarks and surgical technique for permanent placement of a catheter in the right auricle through the subclavian vein. In 1970, Borja and Hinshaw described a simple technique to cannulate the subclavian vein percutaneously for continuous monitoring of central venous pressure. Based on the landmarks outlined by these authors we have devised a means of cannulating the subclavian vein to gain access to the right atrium.

Operative Technique

The patient is anesthetized, intubated, and placed in the supine position with the neck hyperextended. A 3-cm skin incision is made immediately below the lower border of the clavicle centered on the junction of its medial and middle thirds, and within the boundaries of the triangle illustrated in Fig. 1. According to Borja's anatomical studies, the subclavian vein can always be found at this site. At this level the pleura is protected by the first rib, making the possibility of pneumothorax remote. The subclavian vein is ligated with two silk ligatures, and a small purse-string suture is placed in the middle of the exposed vessel; a small incision is then made at the level of the purse-string suture,
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FIG. 1. Anatomical drawing illustrating the imaginary triangle within which the subclavian vein is constantly and easily found. The arrow indicates the site at which the vessel is opened and the purse string suture is placed.

and the end of the shunting device is introduced into the lumen of the vessel for a precalculated distance (Fig. 2). The exact position of the tip of the catheter is then checked by x-ray and electrocardiogram. When it is in the desired position the purse-string suture is tightened around the tube, and this in turn is anchored to the neighboring soft tissues to avoid dislodgement or migration of the catheter (Fig. 3).

A subcutaneous tunnel is then made, preferably under the clavicle, and the rest of the procedure is carried out in the conventional manner.

Results

Five hydrocephalic patients ranging in age from 3 to 54 years were treated with ventriculoatrial shunts utilizing the subclavian vein between April, 1969, and April, 1971. In each the jugular vein was not available. In three children with previous ventriculoatrial shunts, the right internal jugular vein had been used and thrombosed; in two of these the peritoneal cavity had also been utilized as a draining reservoir but the peritoneal catheter had plugged repeatedly. The two other patients were adults with hydrocephalus due to cysticercosis and had had radical neck surgery, which made it impossible for the internal jugular vein to be used. These patients have been followed for 1 to 2 years and no complications or valve malfunction have developed. Each patient has recently been evaluated clinically and radiologically.

Discussion

All neurosurgeons who use the blood stream as a reservoir for shunting procedures in the control of hydrocephalus are aware of the inherent complications. One of the most frequent complications in infants is

FIG. 2. Artist’s conception of the subclavian vein with the opening, the purse string and the catheter introduced in its lumen.

FIG. 3. Chest film taken at the time of surgery showing the position of the catheter introduced through the subclavian vein. Note the esophageal stethoscope medial to the venous catheter.
thrombosis of the internal jugular vein because the venous catheter has been allowed to migrate too high within the lumen of the vessel as a consequence of the patient’s growth. The frustration involved in attempting to recannulate the jugular vein, and the resulting complications when these attempts are carried out too aggressively are also familiar. The alternative routes described to divert the cerebrospinal fluid into the bloodstream are cumbersome and often require vascular or thoracic surgeons. We have described a safe simple surgical approach to the subclavian vein and have used it as an alternate route to the right atrium for ventriculoatrial shunts.

References


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